

285 TechConnect Radio Club

Meeting for 10 September 2011

<http://www.na>tc.org/>

Solve the Problem

- **How to make an RF sampler that:**
 - Can safely drive a spectrum analyzer (ie, Ensemble II) at 100 – 1500 watts of RF power, and
 - Needs minimal adjustment as bands are changed

Do you even need a sampler?

- Ensemble II with ***nothing attached to the antenna port***

Transmitter OFF



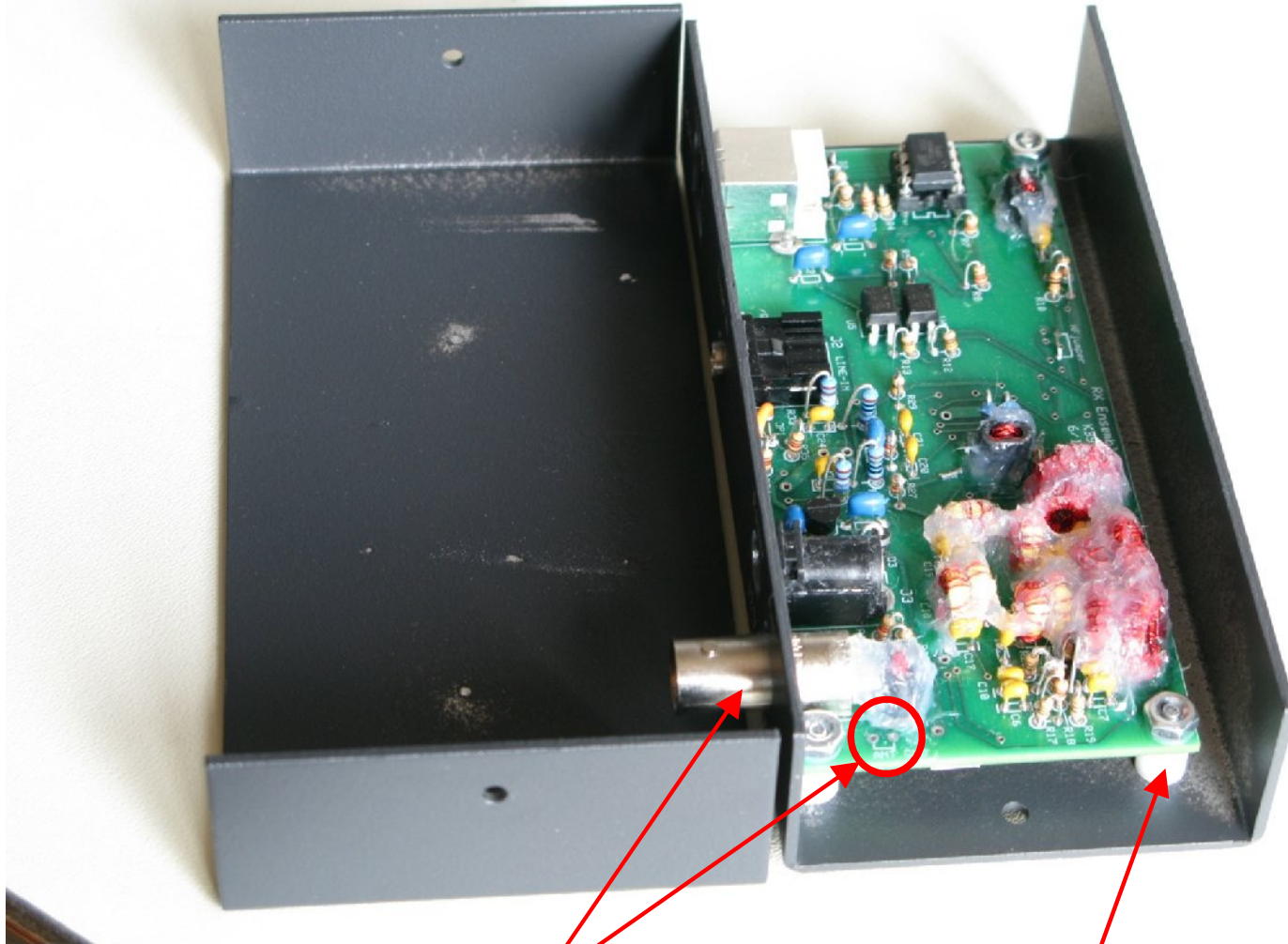
Transmitting on 14 MHz @ 1 watt into a dipole



– I am hoping to resolve this issue in the near future

Use ***caution*** while using the Ensemble II when transmitting

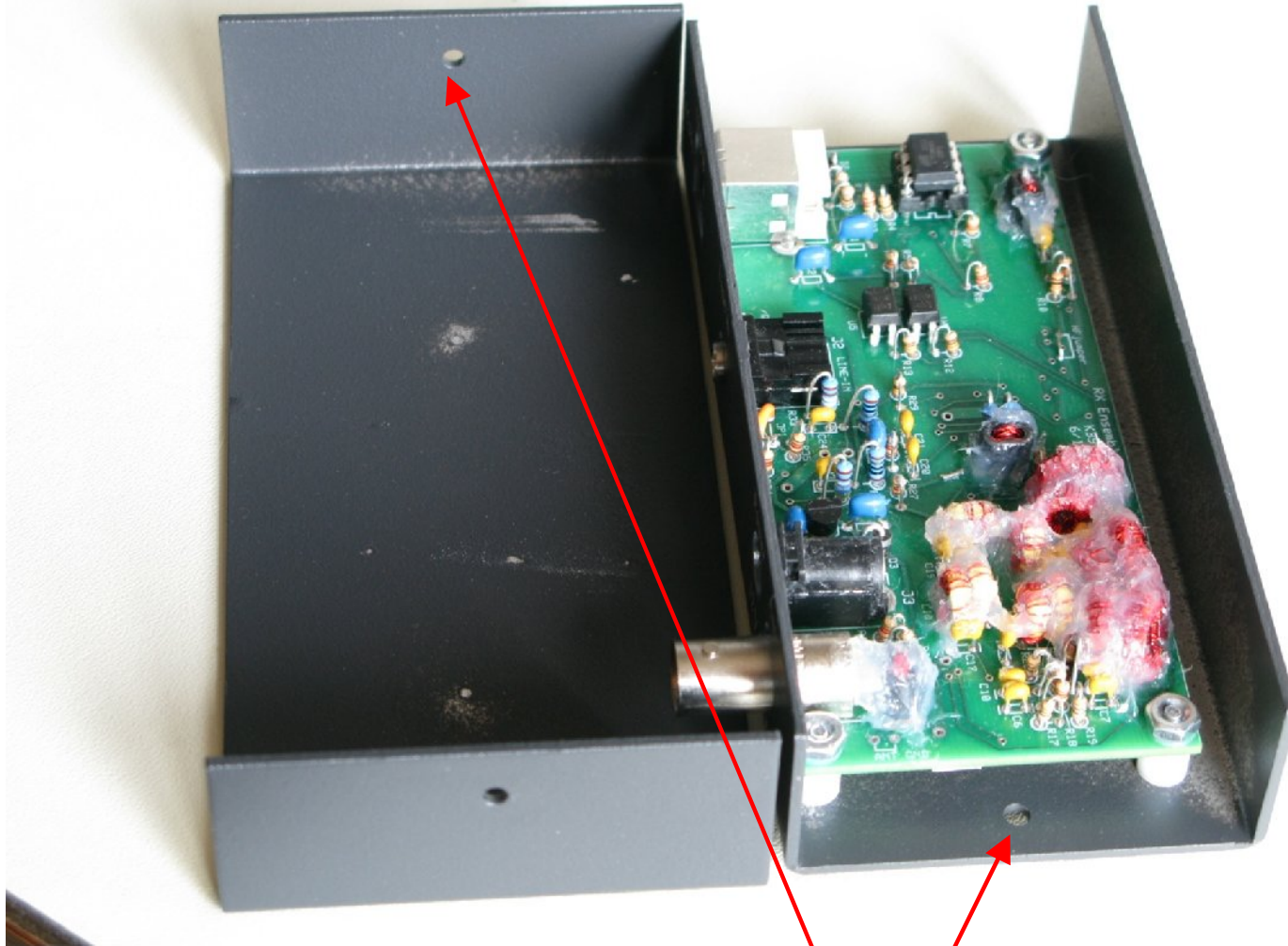
Ensemble II: Some simple RFI mods



**RF input connector and RF ground
are isolated from RF ground**

Box is isolated from board (4 places)

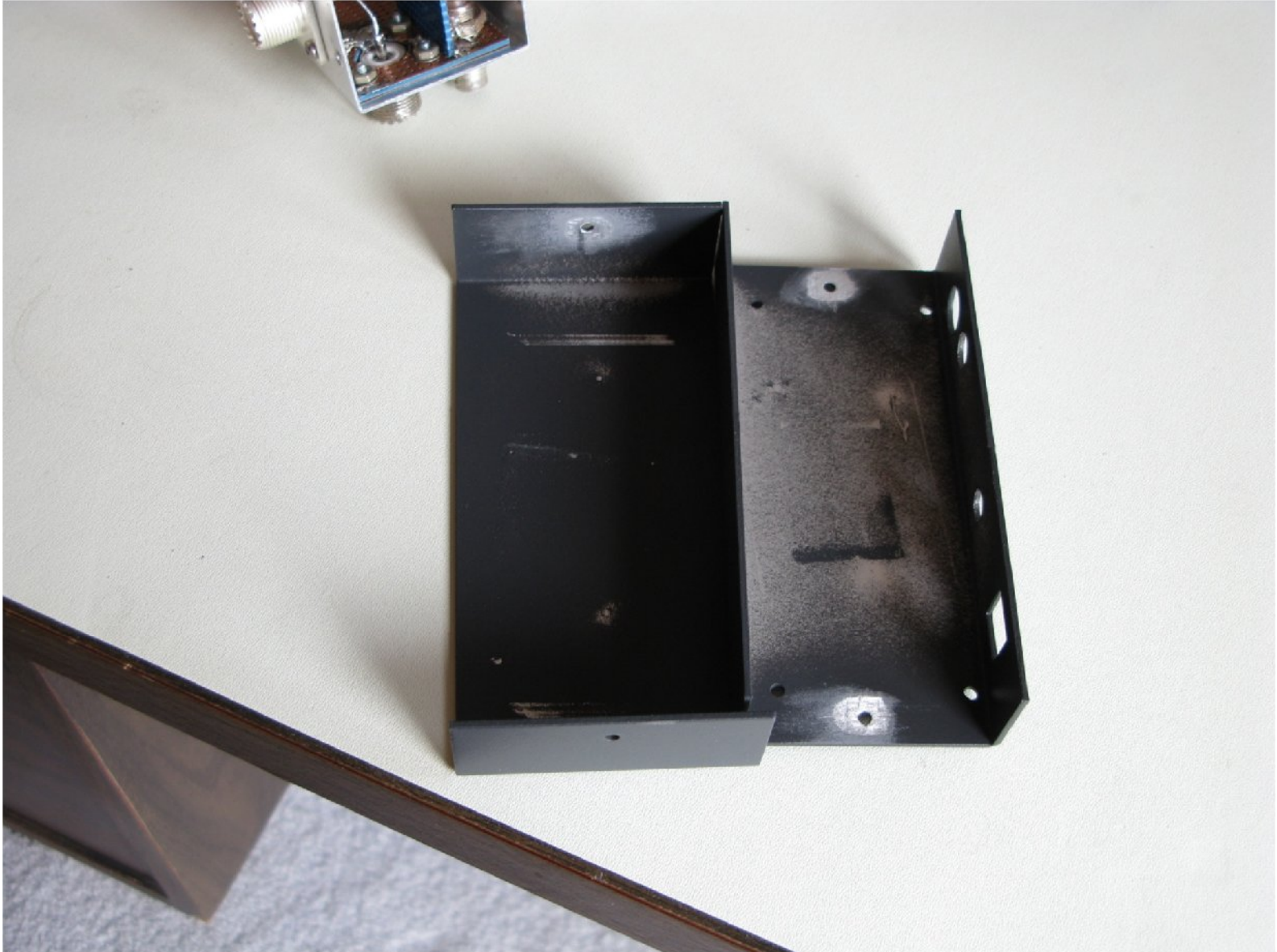
Ensemble II: Some simple RFI mods



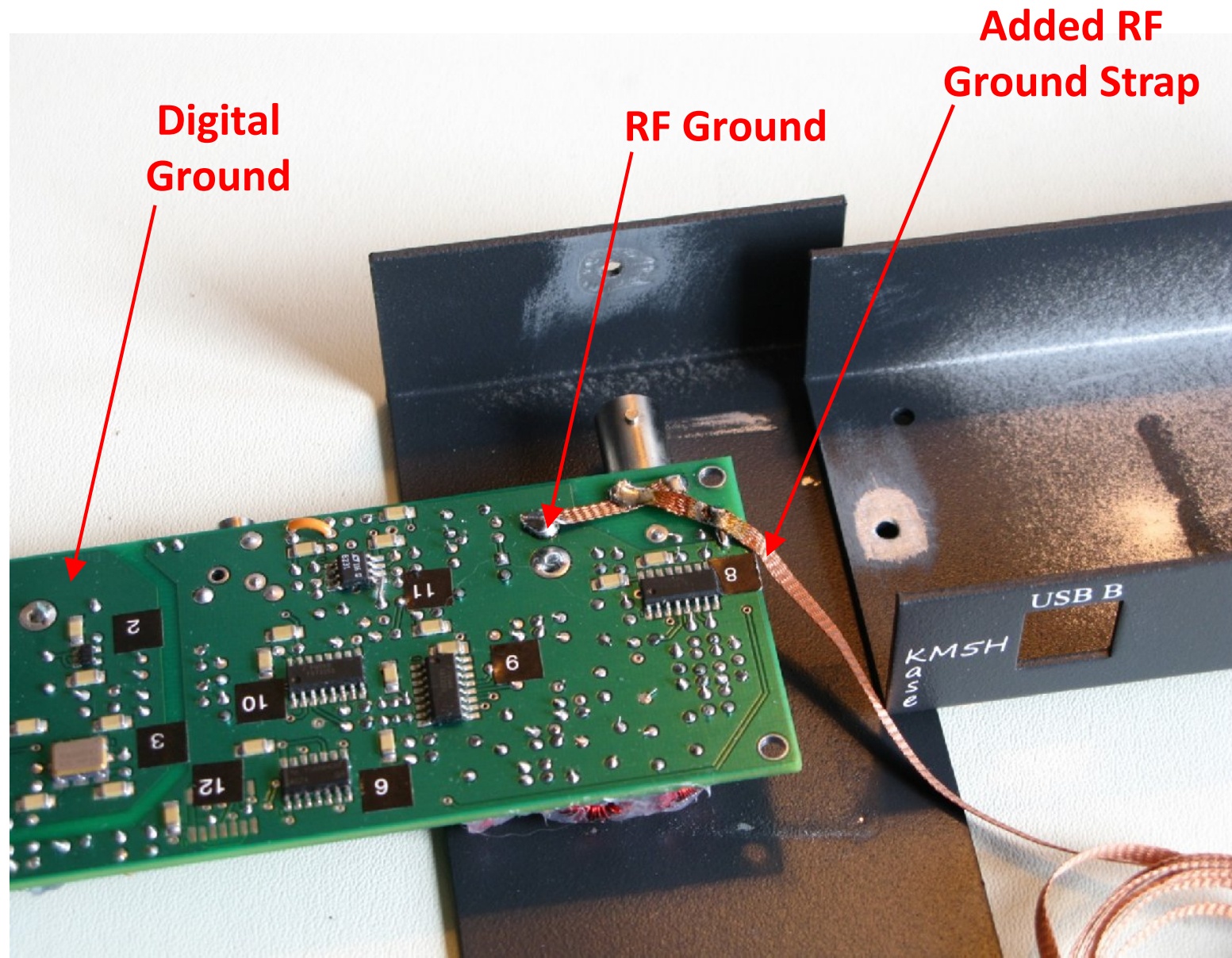
Isolated from box (4 places)

Ensemble II: Some simple RFI mods

Remove paint from box (4 places)



Ensemble II: Some simple RFI mods



Ensemble II: Some simple RFI mods



Ensemble II: Some simple RFI mods

Transmitting on 14 MHz @ 100 watts into a dipole

S7



More to follow!

RF Sampler for High Power

- **Design goals:**

- Frequency range: 1-30 MHz

- Maximum RF input power:

- 100 w = +50 dBm
 - 1.5 Kw = **+62 dBm**

- RF Sample output:

- Maximum output level:

- **Safety:**

- » **0 dBm** (a good number for most sensitive instruments/receivers)

- » Ensemble II: no spec, but 0 dBm should be a good number

- Input device (FST3253) is spec'd at 0.5 Vp

- **Distortion (Two-Tone IMD):**

- » Ensemble II: no spec, but **S9 + 10 dB (-63 dBm)** should be OK

- Flatness: best we can get, but not critical

RF Sampler for High Power

- **Design goals (continued):**

- **Coupling factor:**

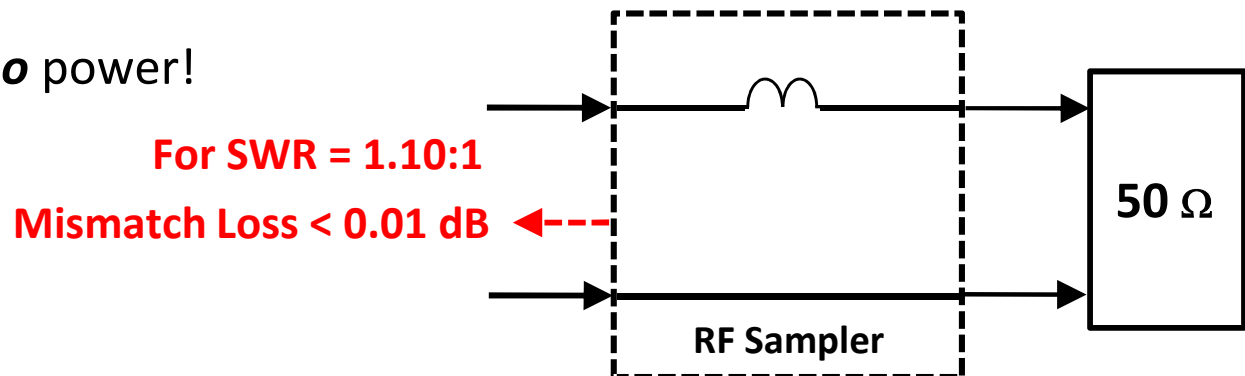
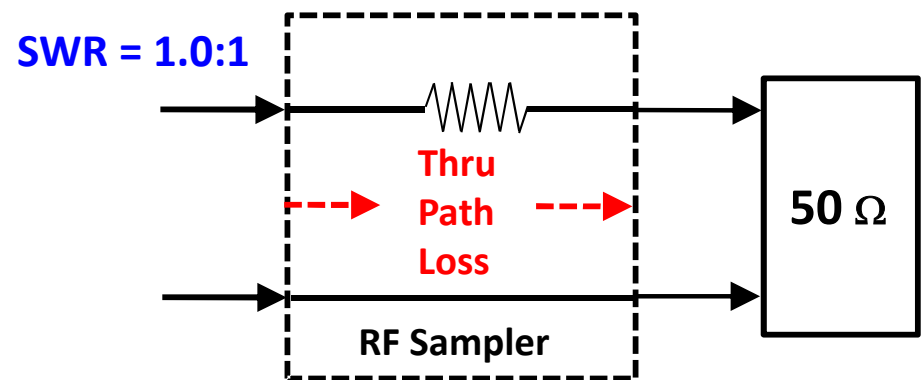
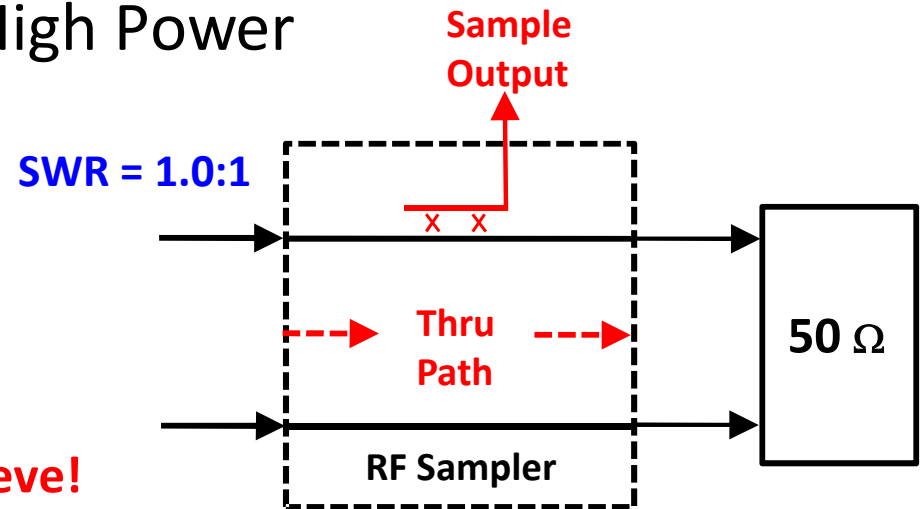
- $100\text{ w} = +50 - (-63) = \mathbf{113\text{ dB}}$
- $1.5\text{ Kw} = +62 - (-63) = \mathbf{125\text{ dB}}$
- **Isolation > 90 dB can be hard to achieve!**
- **Most SWR/power meters only need 20-30 dB**

- **Insertion loss:**

- Thru path loss:
 - needs to be $\sim 0\text{ dB}$
 - $0.1\text{ dB at } 1.5\text{ Kw} = 35\text{ watts}$

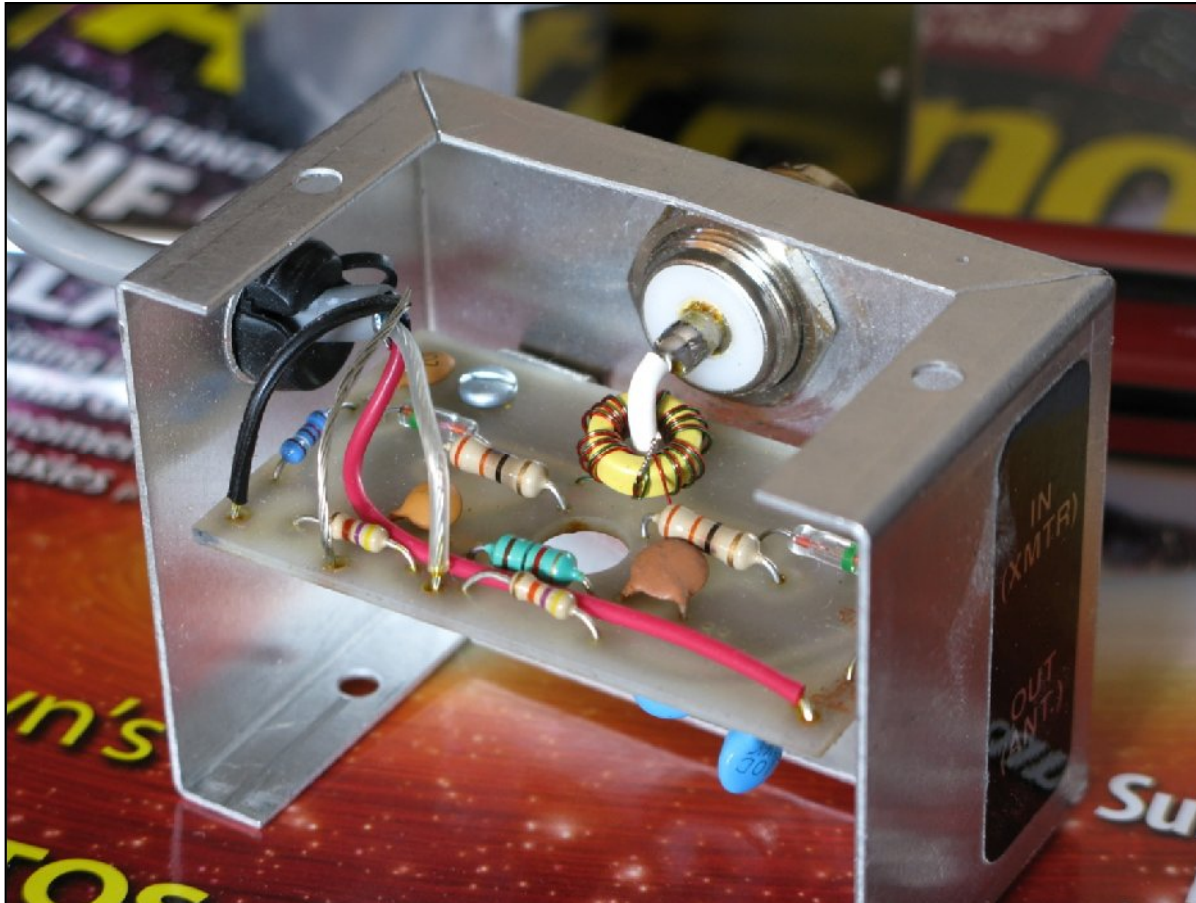
- **Mismatch loss:**

- Reactance dissipates *no* power!



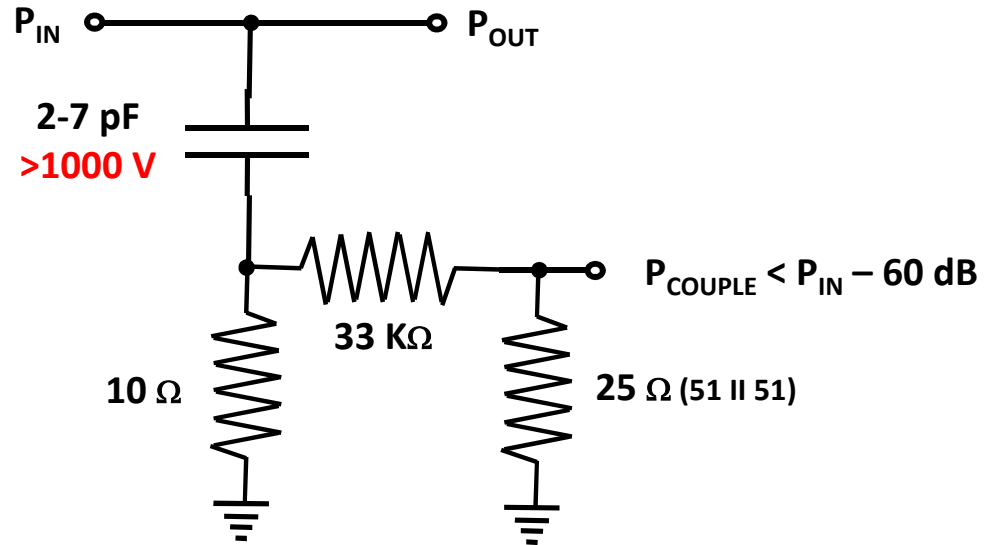
Which Circuit to Use?

- **Current probe:**
 - Commonly used in SWR and power meters
 - Issues:
 - Hard to get below (more negative than) -40 dB coupling factor
 - Core must be chosen carefully (1-30 MHz **AND** maximum power)



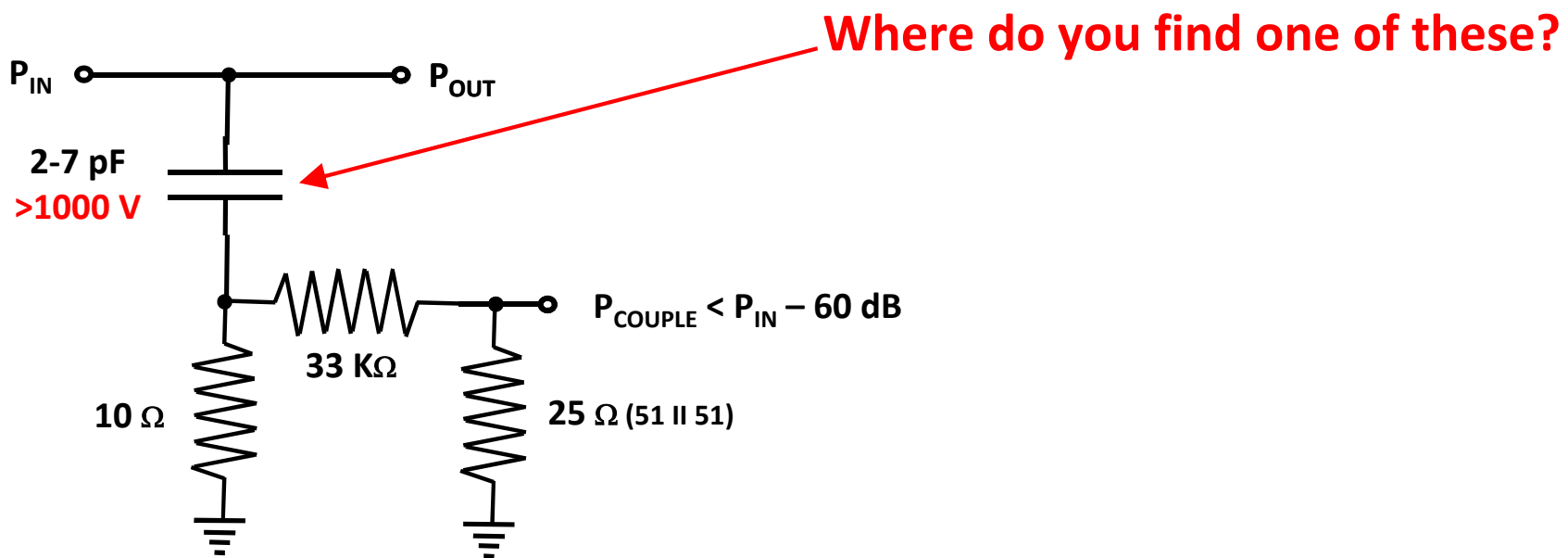
Which Circuit to Use?

- Resistor/Capacitor network:



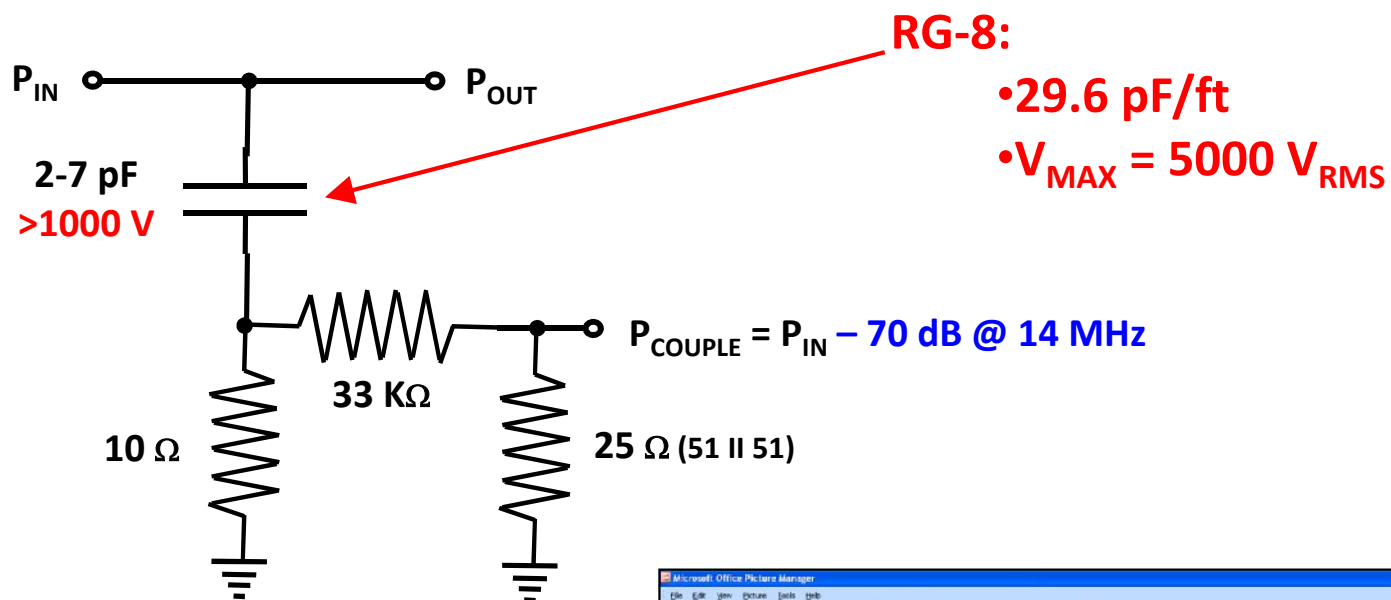
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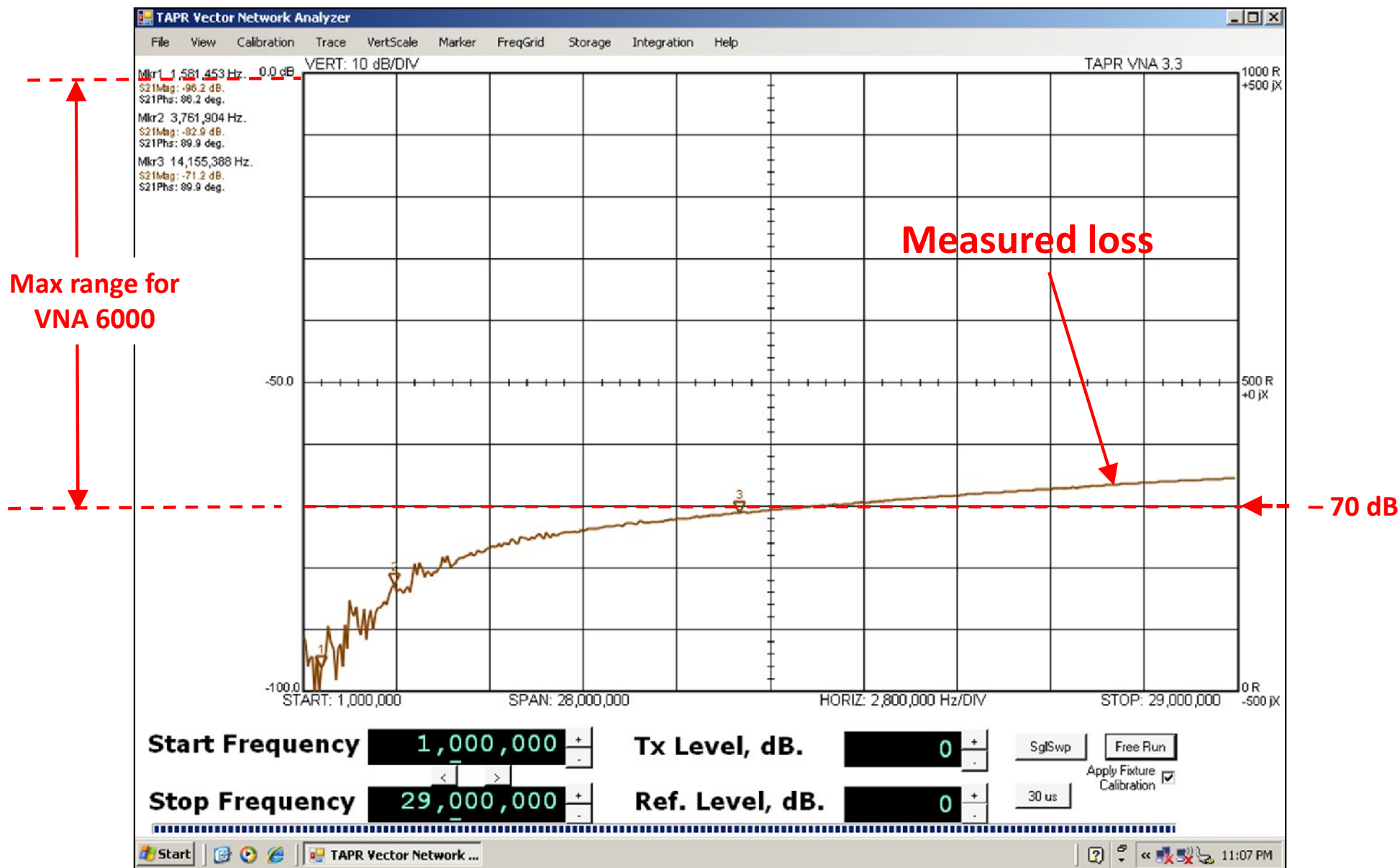
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Which Circuit to Use?

- Resistor/Capacitor network:

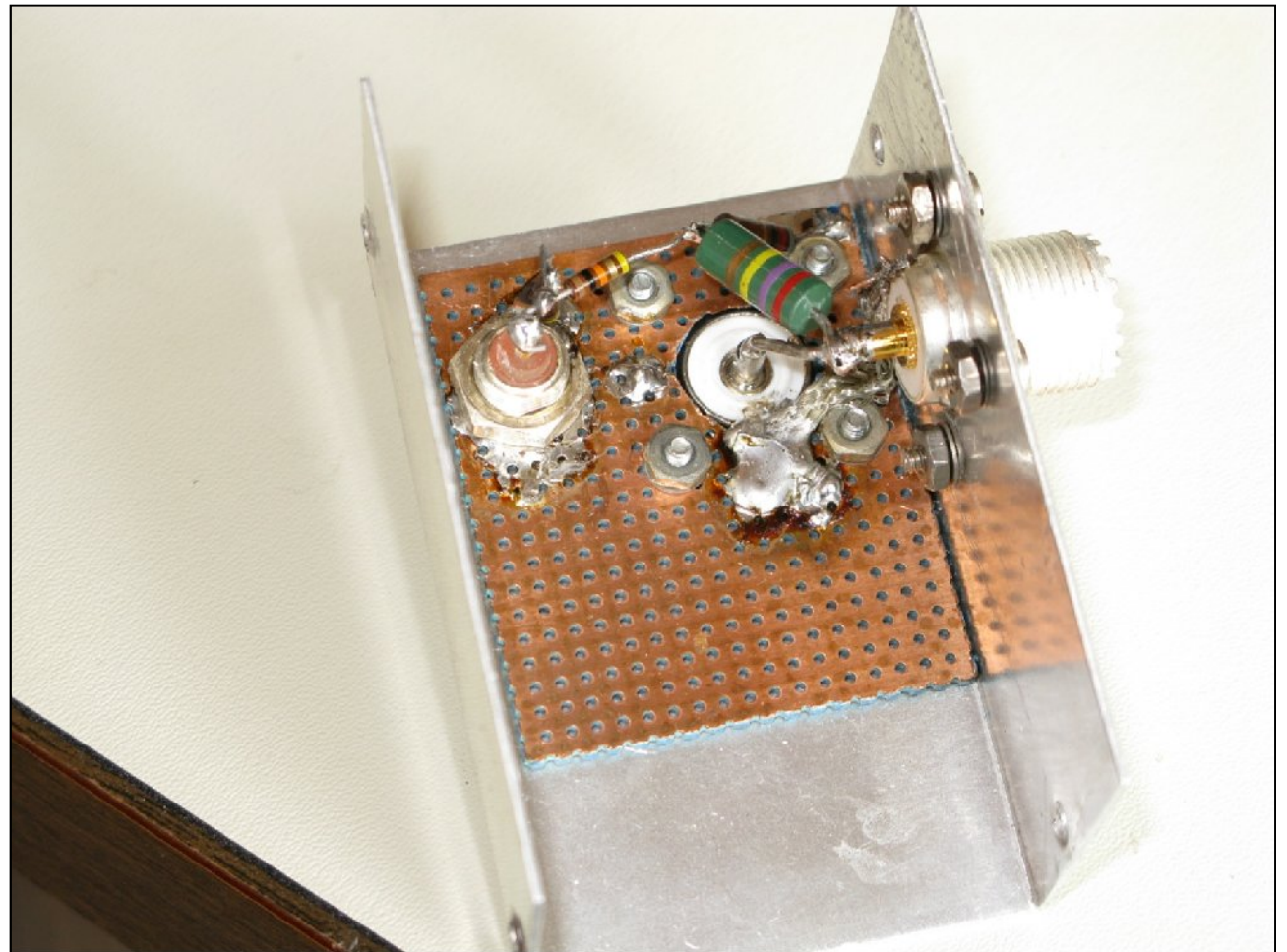
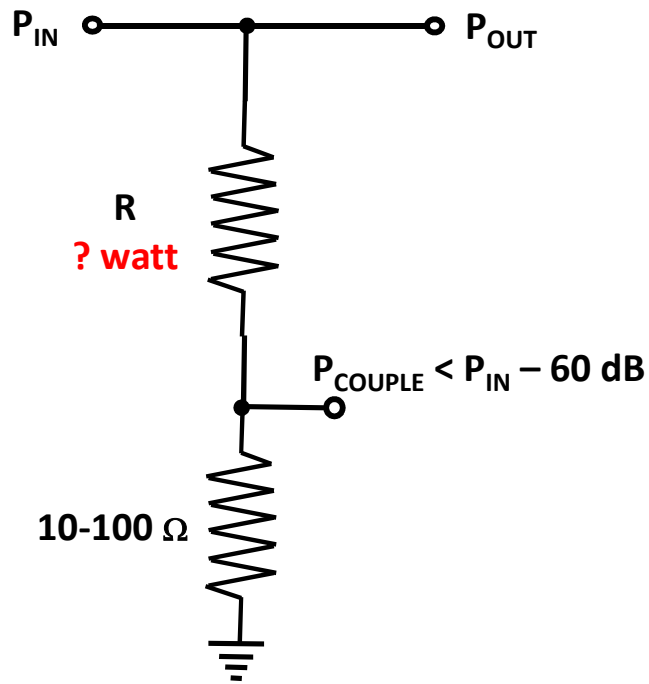


Which Circuit to Use?

- **Resistive divider network:**

- Issues:

- Wattage for resistor R
- Other?

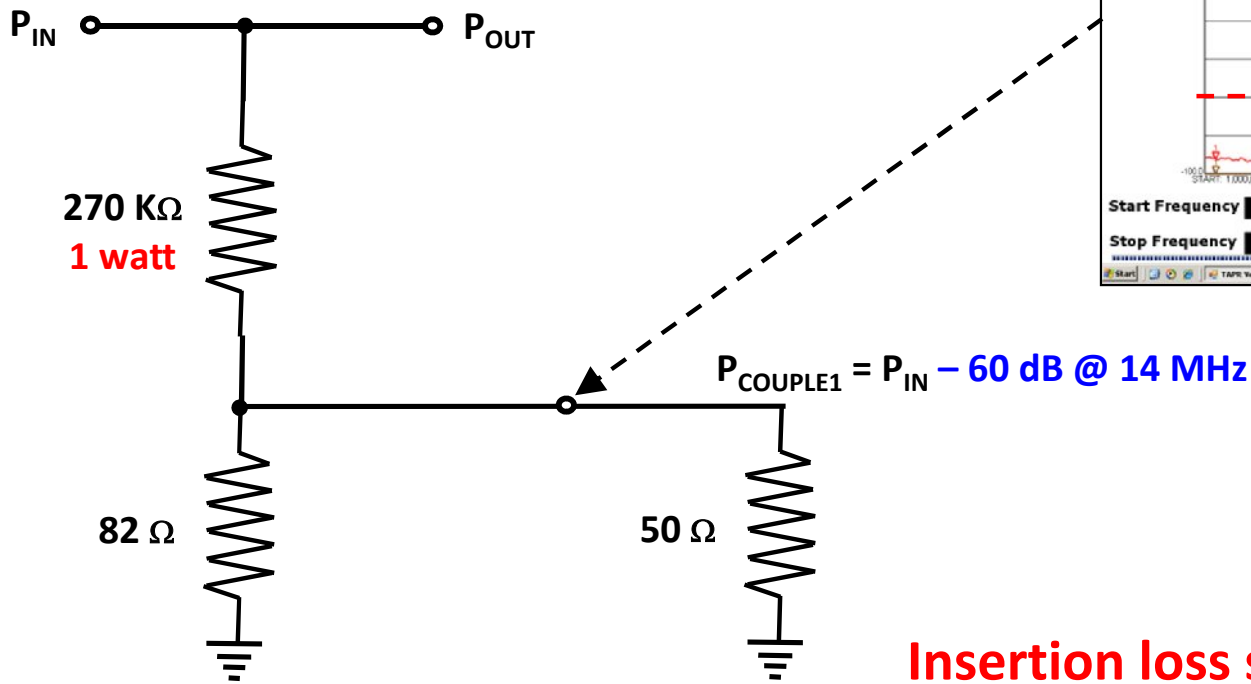


Which Circuit to Use?

- **Resistive divider network:**

- Issues:

- Wattage for resistor R
- Other?



Measured loss



- 60 dB

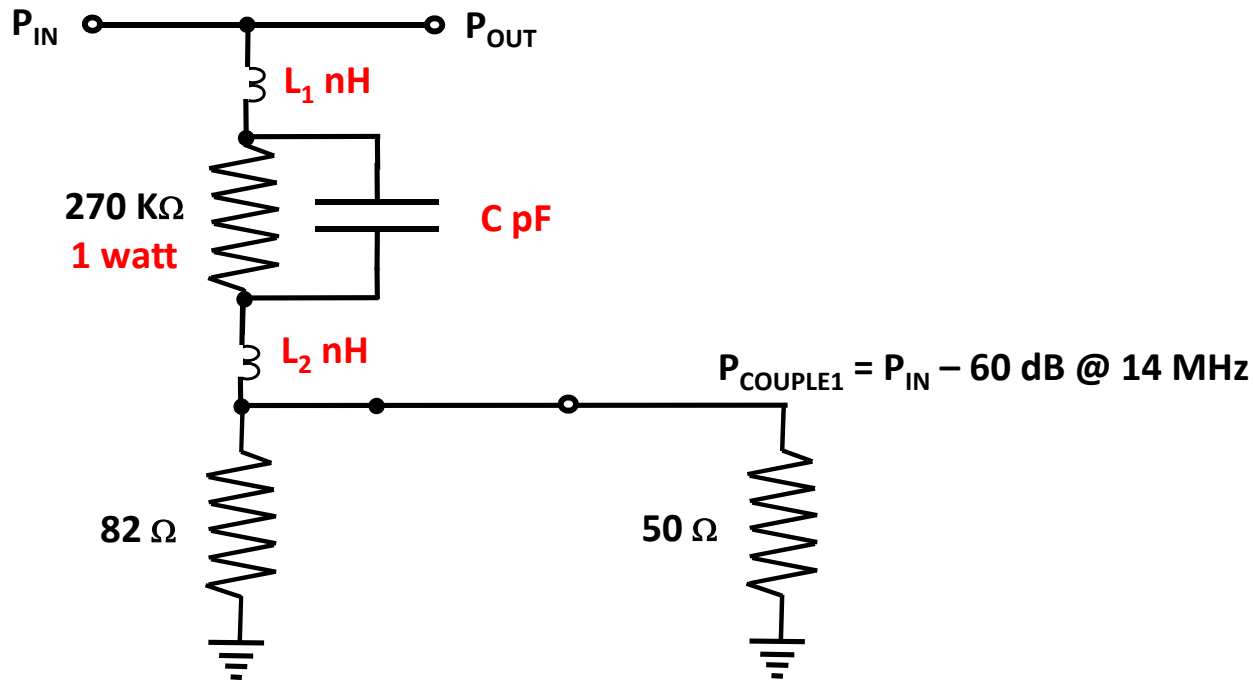
Insertion loss should be -80 dB and flat??

Which Circuit to Use?

- **Resistive divider network:**

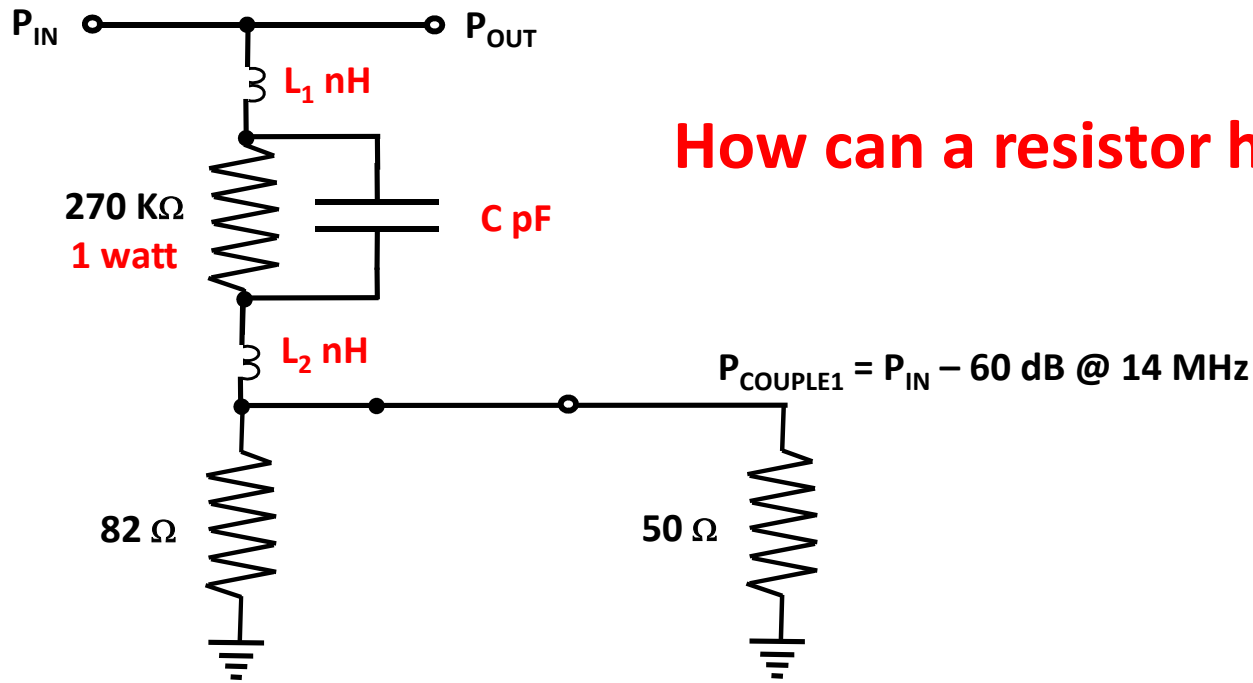
- Issues:

- Wattage for resistor R
- Resistors at RF = **RLC network**



Which Circuit to Use?

- **Resistive divider network:**
 - Issues:
 - Wattage for resistor R
 - Resistors at RF = *RLC network*



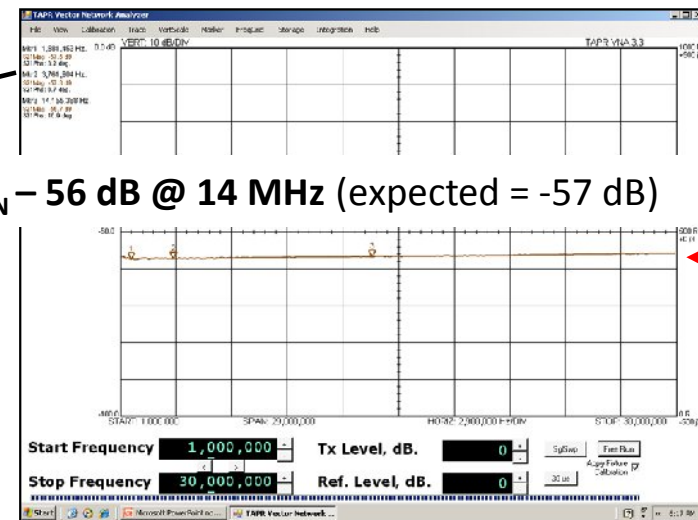
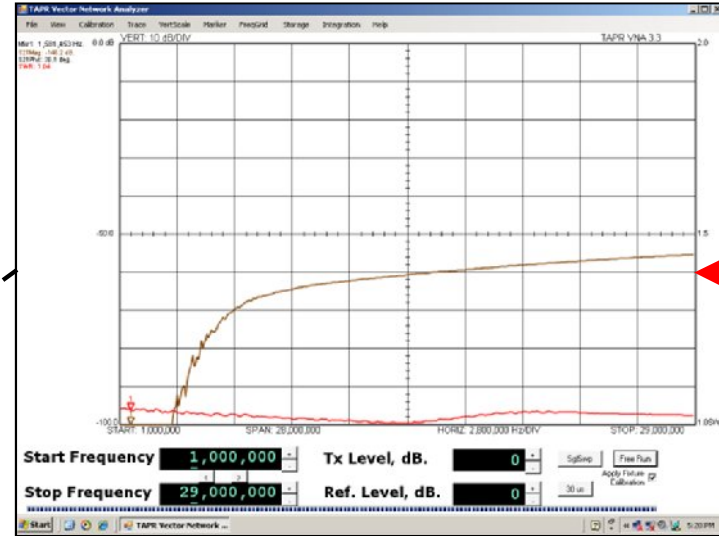
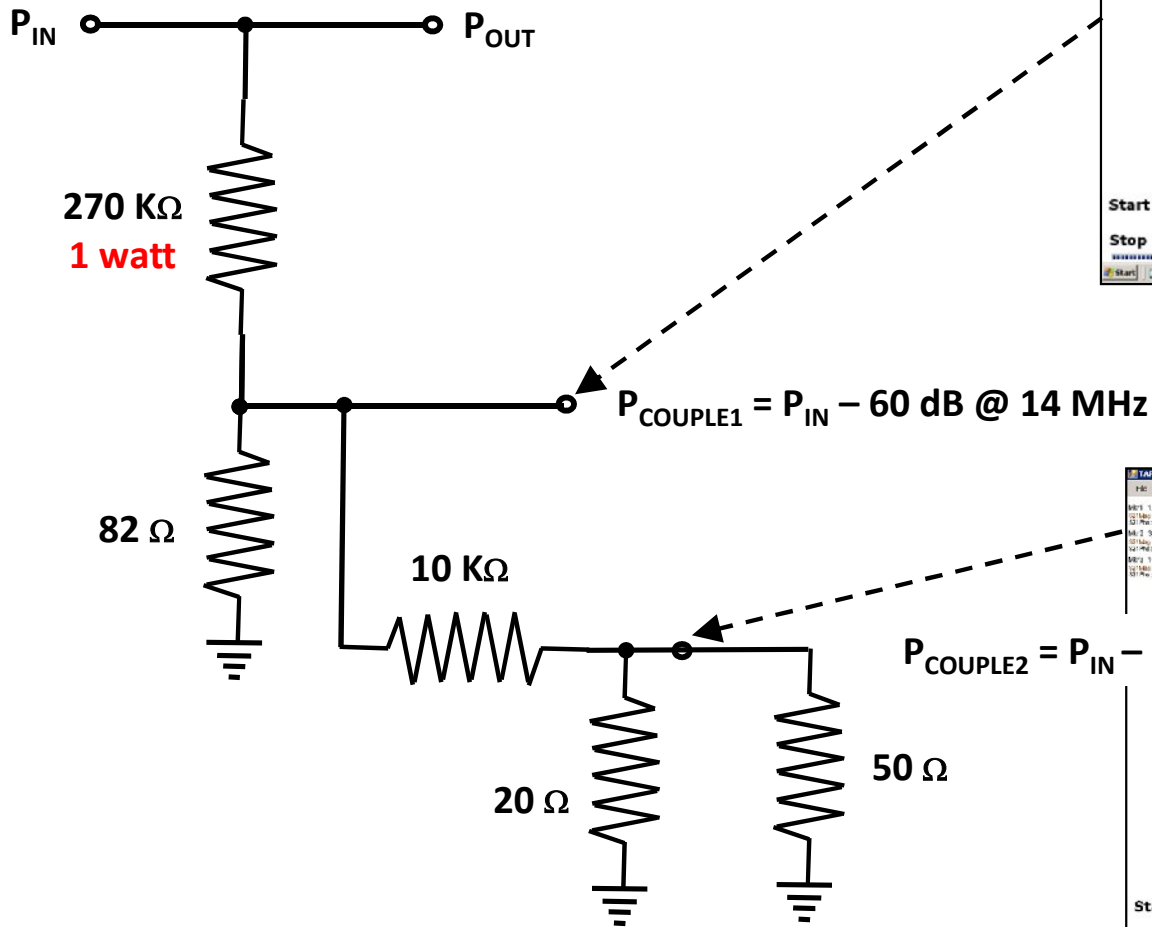
How can a resistor have capacitance?

Which Circuit to Use?

- Resistive divider network:

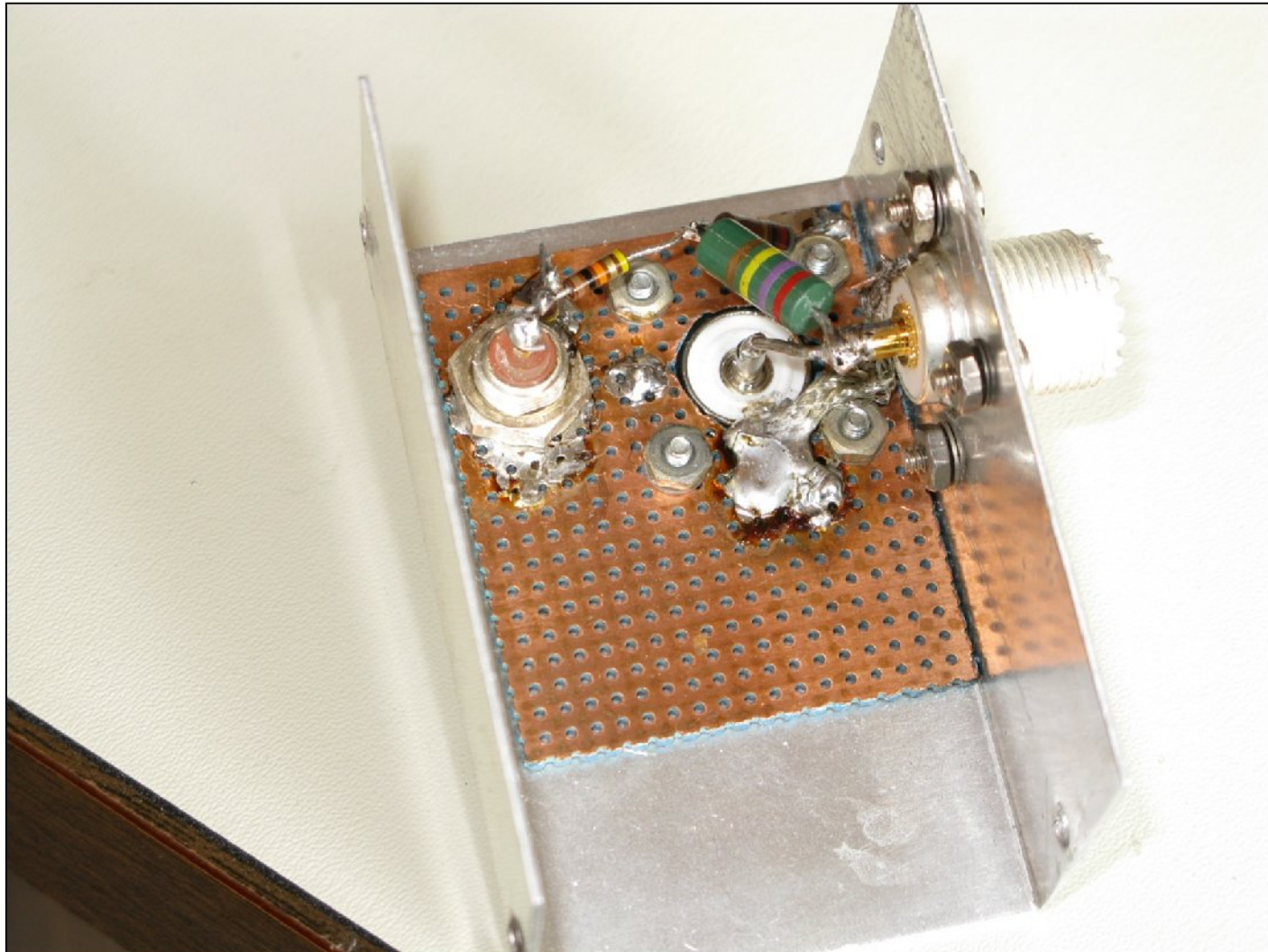
- Issues:

- Wattage for resistor R
- Resistors at RF = RLC network



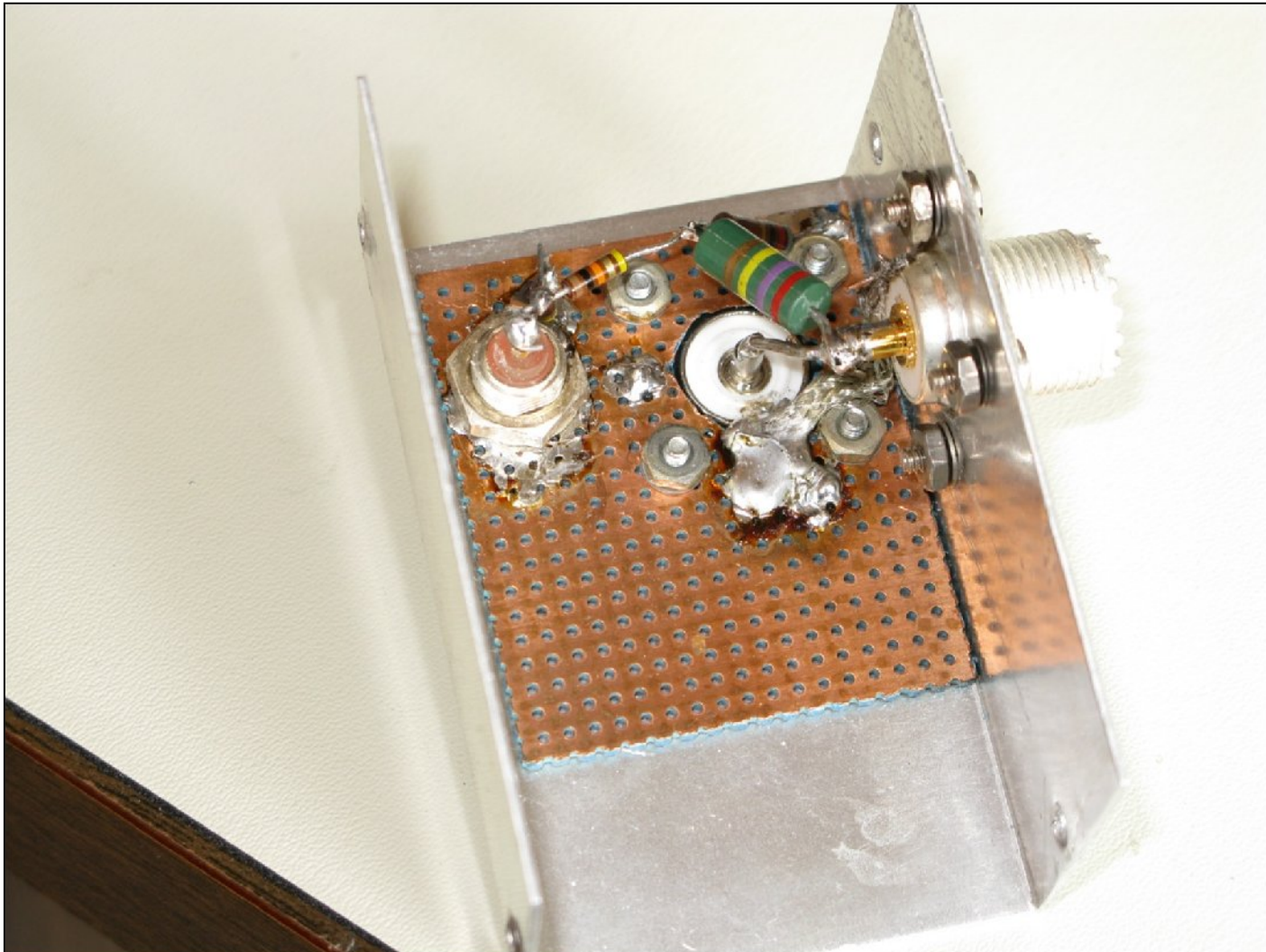
Which Circuit to Use?

- **Resistive divider network:**
 - Do we really get **-116 dB** $[-60+(-56)]$ coupling factor?



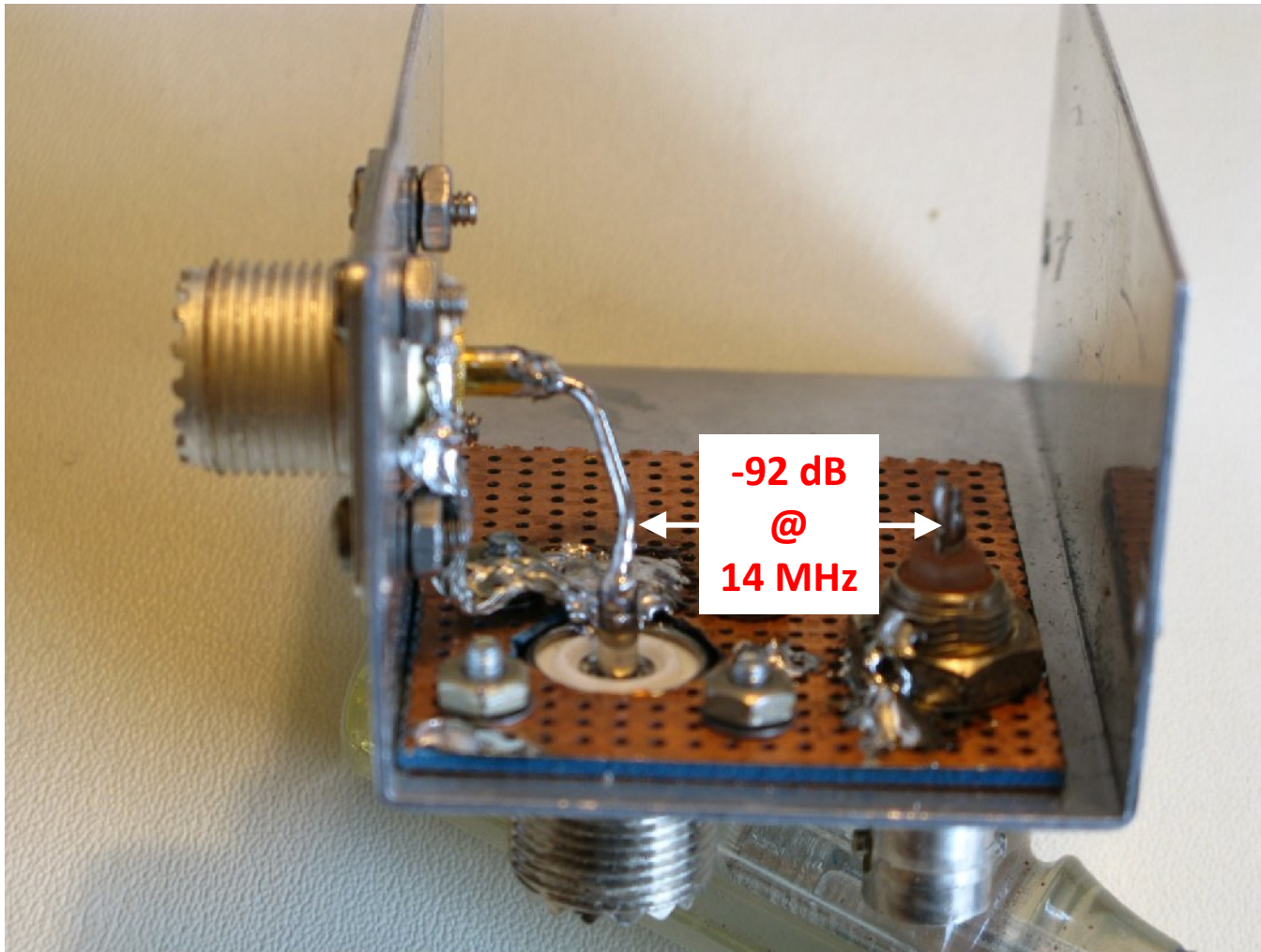
Which Circuit to Use?

- **Resistive divider network:**
 - Do we really get **-116 dB** $[-60+(-56)]$ coupling factor? **No!**
Only get -92 dB @ 14 MHz!



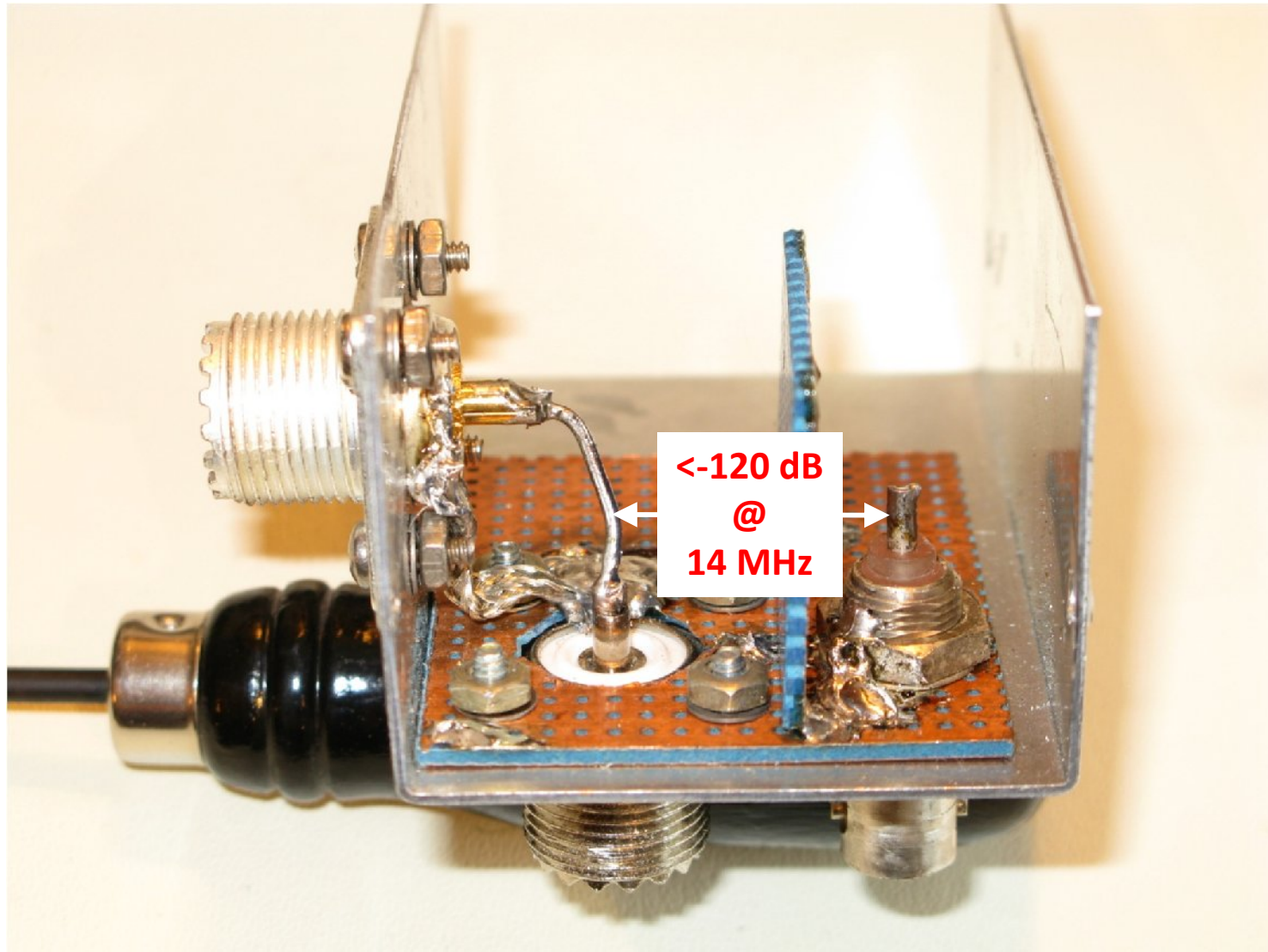
Which Circuit to Use?

- Isolation @ 14 MHz:



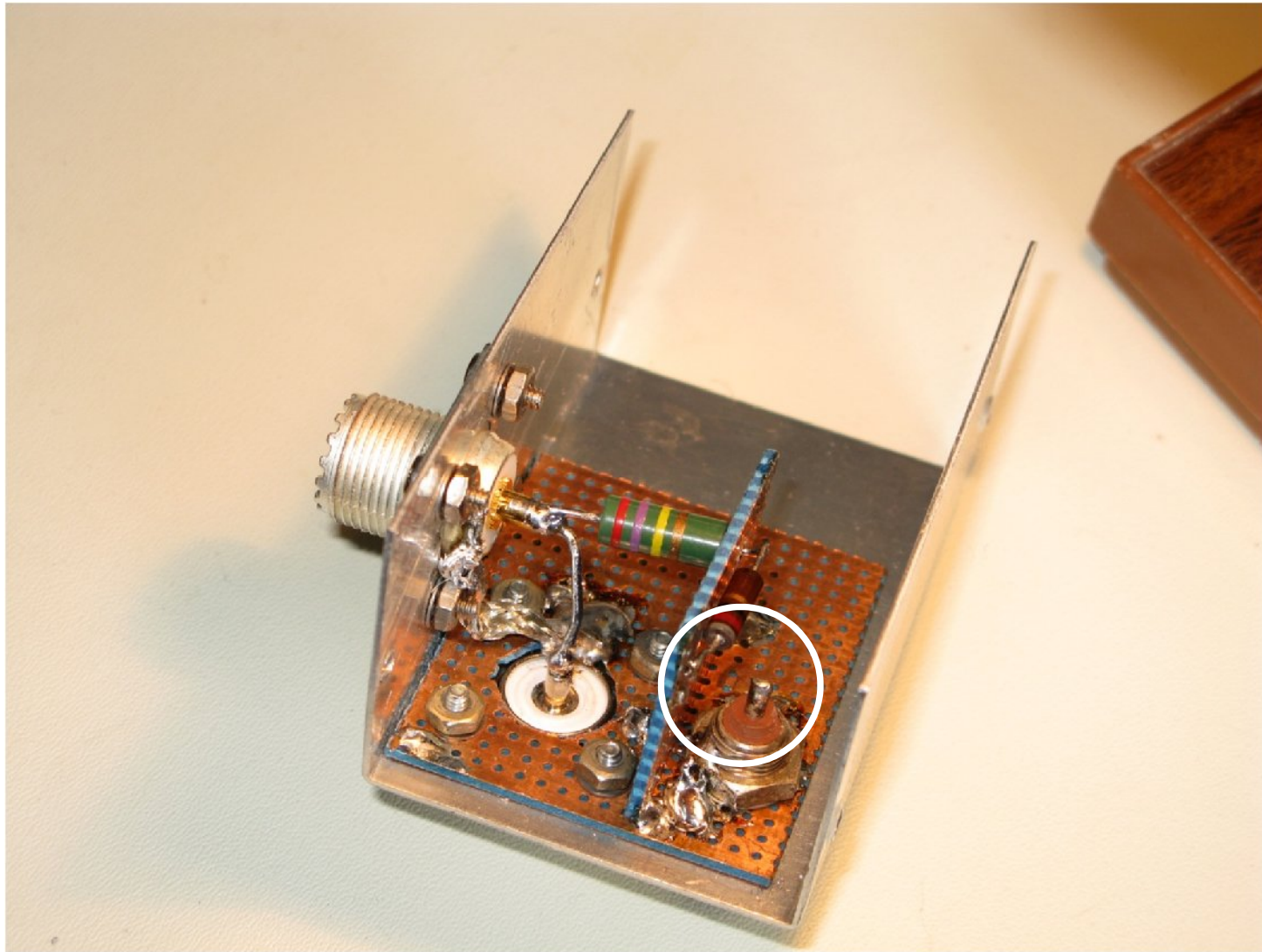
Which Circuit to Use?

- Isolation @ 14 MHz:



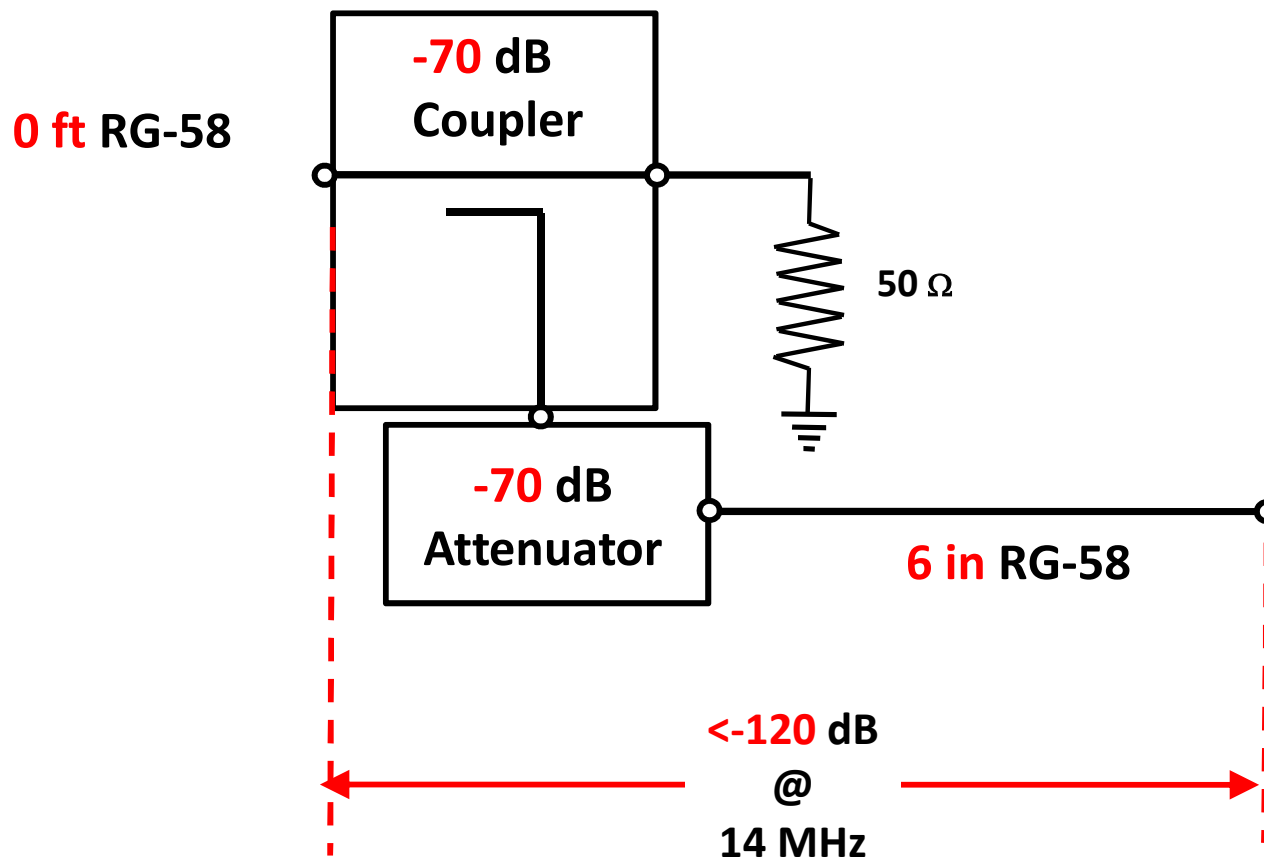
Which Circuit to Use?

- **-110 dB Isolation @ 14 MHz :**



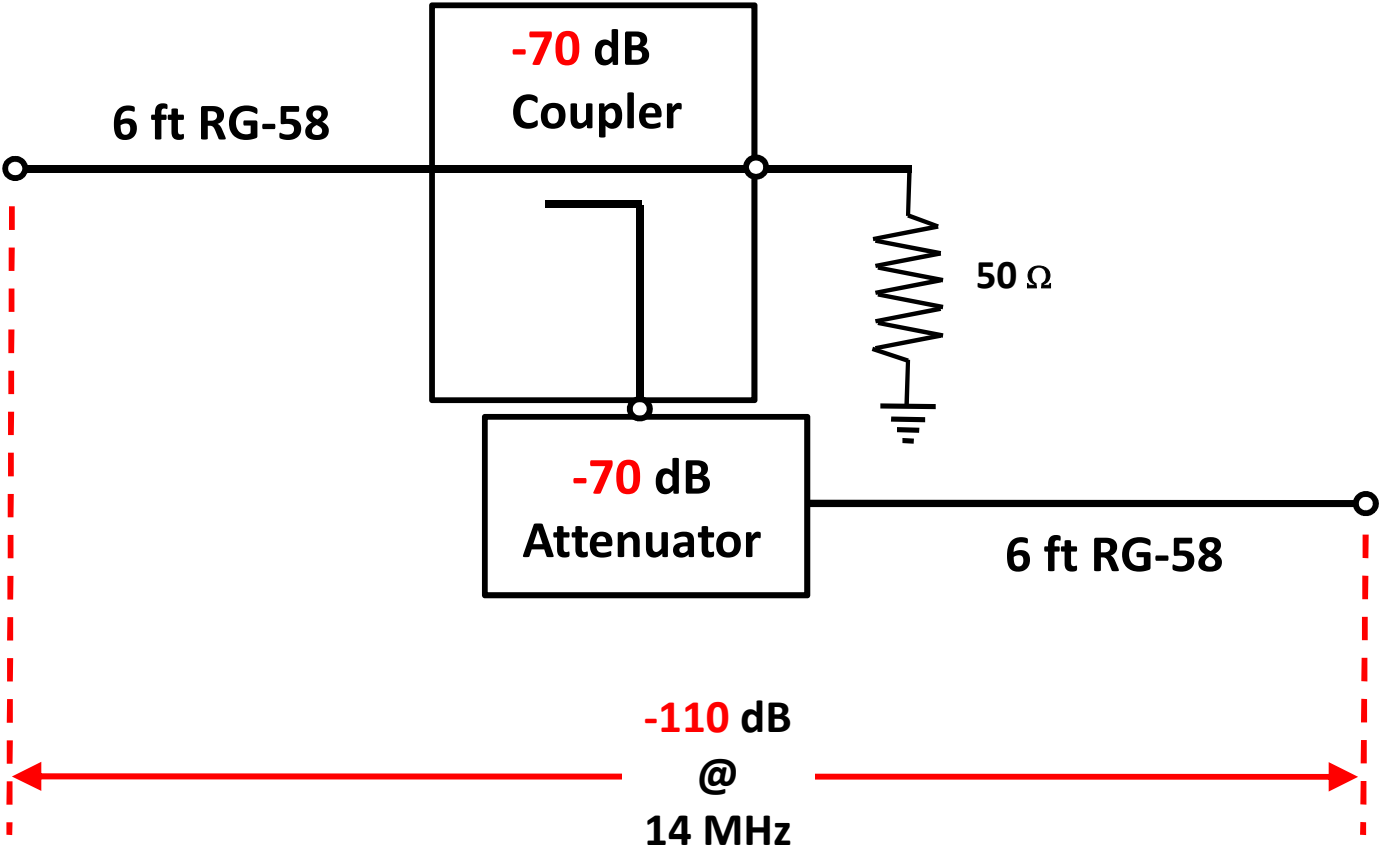
Which Circuit to Use?

- Isolation @ 14 MHz:



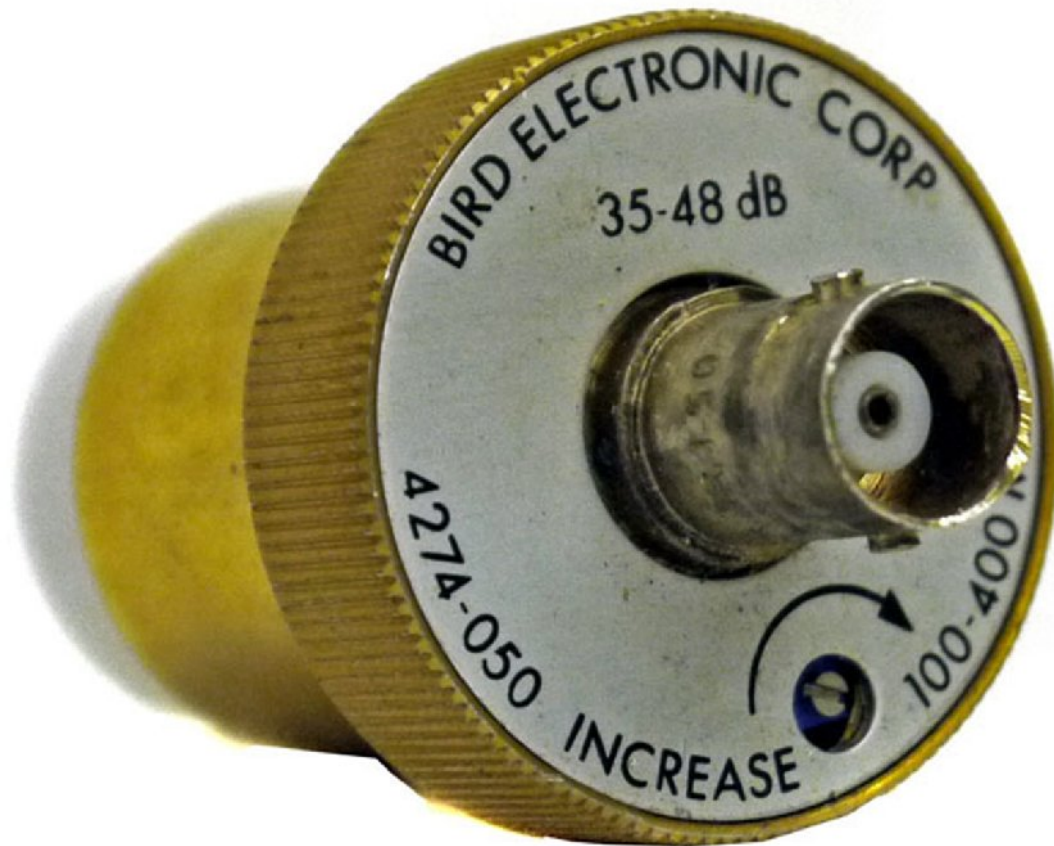
Which Circuit to Use?

- Isolation @ 14 MHz:



Which Circuit to Use?

- **Bird RF Samplers (>\$100)**
 - Like all of their slugs, these are also band specific



Elecraft Has Many Kits

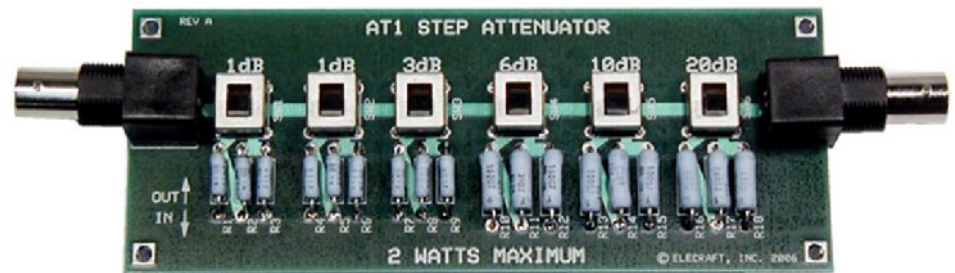
CP1 Directional Coupler

- 1-30 MHz
- Coupling;
 - 20 dB/25 watt
 - 30 dB/250 watt
- \$40 (kit)



AT1 41 dB HF/VHF Switched Attenuator

- DC-220 MHz
- 0-41 dB
- \$60 (kit)



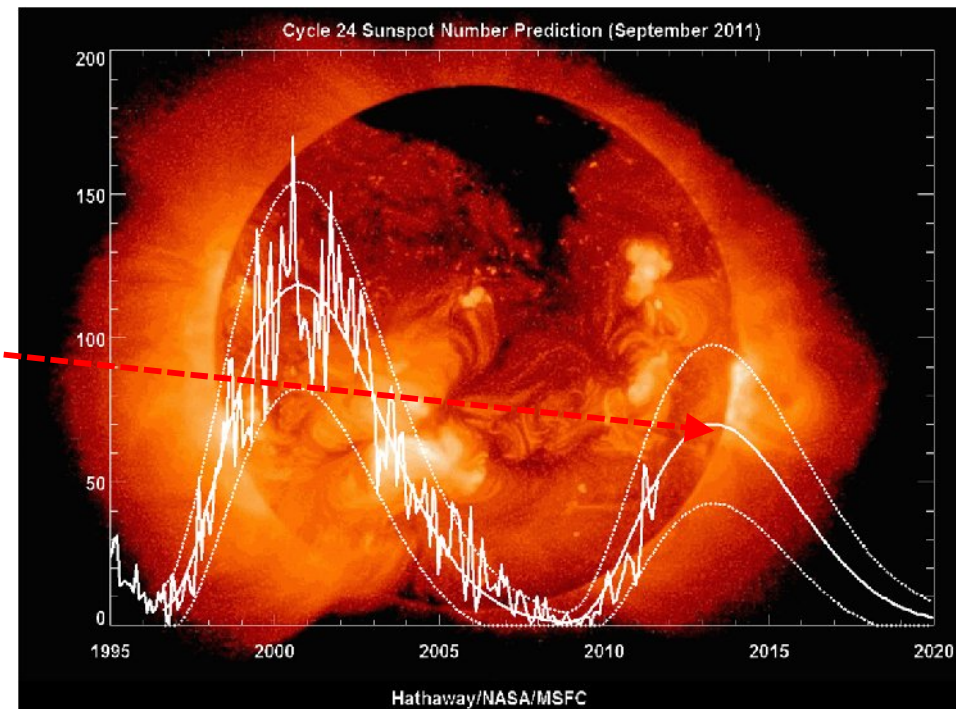
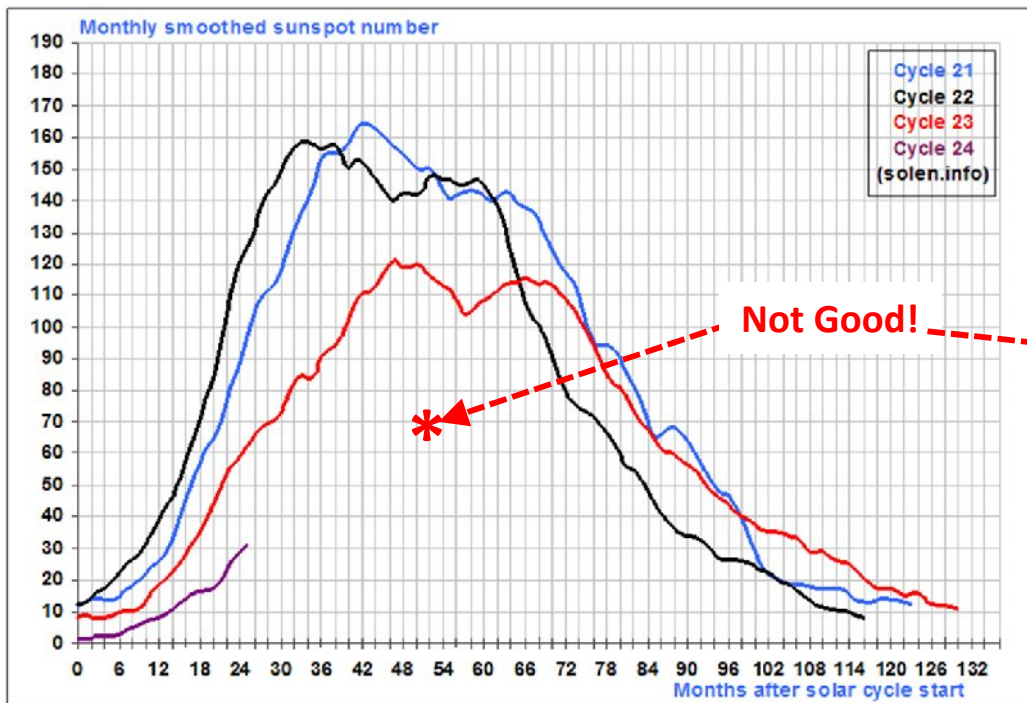
2T-gen 2-Tone Test Oscillator

- \$70 (kit)



Propagation Update:

- Up & down summer
- Increasing number of significant flares & CMEs
- NASA now predicts the SSN peak to be **69 in May 2013**



Info of General Interest

- ARRL Convention reports?

Info of General Interest

- Genesis G59 SDR Transceiver

Genesis G59 Software Defined Radio Transceiver SDR QRP - Windows Internet Explorer provided by Qwest

http://www.genesisradio.com.au/G59/

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Genesis G59 Software Defined Radio Transceiver SDR... Home Print Page Tools Help


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Genesis G59: All Mode 160-6m SDR Transceiver Kit

"The Best SDR Kit on the Amateur Radio Market"

This is a bold claim but we're part of a group of dedicated builders, talking from our own experience, who are convinced that the Genesis G59 is the best performing SDR kit for the money currently available to amateur radio operators.

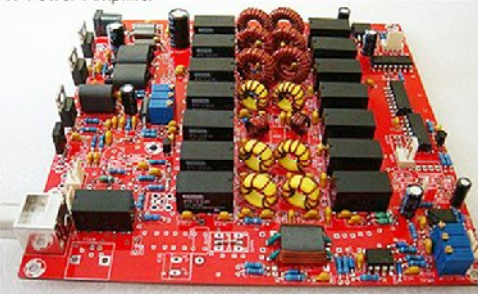
The G59 is an all-mode 160-6m SDR transceiver with 10mW of output power. The output is boosted to 10W with the GPA10 linear amplifier.



Genesis G59
160 - 6m SDR Transceiver

Genesis GPA10

10W Power Amplifier



PRICE
The price of the G59 is **US\$349** and the GPA10 is **US\$129**, plus worldwide registered airmail delivery.

start Aug 2011 Mtg RF Sampler for High P... Presentation1 MEN.com - Windows I... Genesis G59 Softwer... Internet 100% 1:59 PM

Upcoming Events

- Upcoming Club Meetings:
 - **October 1**
 - **November 5 (TechFest)**
 - **Location: Fire station #1**
 - **December 3 (Holiday lunch)**
- Swapfests:
 - BARCfest (Sept 25 in Longmont)
 - ?
- Edge of Space Sciences (EOSS) Balloon Launches:
 - 05-Nov-2011 (Dual launch?)
- **Other events to list?**

Presentation(s)

<http://www.naotc.org/>

Measuring RF Parameters of Networks